

tish Museum), has not, as yet, elicited a reply. In October 1849 Capt. Hutton communicated to me his description of the animal of his sinistrorse discovery, *D. Huttoni*, Pfr., from Mussoorie (not Muporee as printed in the Monograph), or rather from a lower elevation at Jerreepanee. In this species also it appears that an operculum was not observed. Can it be possible that the animals of this genus have a general habit of casting off their opercula? I can only account by some such supposition for not seeing it among the hundreds which I have seen or taken alive, and for its escaping several examinations of the animal, made with a view to description, and to fixing its position with reference to the anomaly of the form among the *Carychiadae*, unless the appendage be concealed in the fleshy part of the foot.

Malvern, February 17, 1853.

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XXVII.—On the *Animal of Myochama anomioides*.

By ALBANY HANCOCK, Esq.

[With a Plate.]

THE animal of *Myochama anomioides* is at present only imperfectly known. I am, therefore, fortunate in possessing an individual well preserved in spirits. I owe this advantage to John Wickham Flower, Esq.,—the same gentleman to whom I am indebted for the specimen of *Chamostrea albida* which was recently described in the 'Annals.'

The mantle-lobes of the animal now before us are very unequal, as might be inferred from the form of the shell, the right or attached valve of which is small and flat, the left large and much inflated, particularly towards the umbo, which is excessively developed. The mantle is delicate and pellucid, revealing to some extent, through its substance, the various organs; it is entirely closed with the exception of the siphonal orifices, the pedal opening, and a fourth minute aperture similar to that described in *Chamostrea*. On looking down upon the large or left lobe, the ovary (Pl. XI. fig. 1 *p*) is seen through the membrane to occupy the umbonal region, and below it the body or visceral mass and gill can be partially observed. On each side the adductor muscles are conspicuous; they are not large, the posterior (*q*) being irregularly rounded, the anterior (*r*) somewhat elongated and arched outwardly. The posterior extremity of the animal is slightly truncated, and here the margins of the mantle separate and form a shallow recess (fig. 3), within which are situated the

siphonal tubes. These latter are quite distinct, though placed near together at their origin; they are rather long and narrow, the exhalant or upper tube (*b*) being slightly inflated towards the extremity, and longer than the other (*a*); but this disparity may be owing to the irregular contraction of the parts. The orifice of each is fringed with a circle of simple, minute papillæ; the papillæ of the inhalant tube were very imperfectly observed. I failed to detect the siphonal tentacles described by M. Deshayes. The fourth orifice (fig. 3 *c*, & fig. 1 *i*), which is minute and circular, is situated immediately below the inhalant tube, and within the inferior angle of the recess formed by the margins of the lobes. This orifice leads into the branchial chamber, and is undoubtedly similar to the fourth aperture which I have pointed out in *Chamostrea*, and in some other Lamellibranchs with closed mantles; and here, as in them, it is probably for the purpose of allowing the water to escape on the sudden withdrawal of the tubes and closing of the valves. The pedal orifice (fig. 1 *d*, & fig. 4 *a*) is very small, and is situated far forward directly below the anterior adductor muscle (fig. 4 *c*, *c*, *c*) which forms its superior wall, and around the lower extremity of which the foot would seem to play. At this point, which corresponds to the angle of the shell indicating the union of the anterior slope with the ventral margin, the borders of the lobes (*b*, *b*) separate a little, forming a similar recess to that from which the tubes issue. The pedal orifice is at the lower angle of this recess, all the rest of the space above being closed by the adductor muscle, much in the same manner as in *Chamostrea*. The margins of the lobes, in the vicinity of the pedal orifice and siphonal tubes, are simple and grooved; along the anterior and posterior slopes (fig. 1 *a*, *b*) they are closely united forming a sharp edge, and following the ventral margin (*c*) they can be traced as two indistinct grooved ridges closely approximating to each other.

When the mantle-lobe is laid open, the body or visceral mass (*j*), partially enveloped in the gills and projecting from above, is found to occupy the greater portion of the branchial chamber; the pedal orifice (*d*) being seen at the anterior extremity, and the two siphonal apertures (*e*, *f*) at the posterior; the latter having the fourth minute opening (*i*) immediately below them.

The mouth (fig. 2 *d*) is situated above directly in front of the visceral mass; it is rather large, transversely oval, and guarded by two pairs of palps (fig. 1 *l*, & fig. 2 *e*, *e*, *f*, *f*). The membrane uniting the upper is ample, and forms a hood overhanging the oral aperture; the lower pair are also united at the base by a membrane of considerable extent. The palps, which are of moderate size, are wide at the base, and gradually taper to a point; the laminae on the inner surface are not numerous, there being,

on each, only fourteen or fifteen large, transverse plates sloping from the external margin to the point: the border of this margin is smooth.

There is on either side of the visceral mass a single gill-plate, and a rudimentary gill-plate, which, from their arrangement, have much the appearance of forming but one leaflet. This apparent single leaflet is of a triangular form with one of the angles directed backwards, and is attached the whole extent of the dorsal margin, the anterior or ventral border alone being free. This border is grooved and terminates above, at the side of the mouth, between the upper and lower palp; the posterior angle is united below the visceral mass to that of the leaflet of the opposite side. The external surface of the leaflet is divided longitudinally by a line (fig. 1 *o*) into two portions—an anterior or ventral, and a posterior or dorsal; the anterior or ventral (*m*) is much the larger, and is a perfect gill-plate, being composed in the usual way of two laminae, with the space between them divided into wide, transverse tubes, which open into a dorsal channel. There are two such channels, one on each side of the visceral mass corresponding to the gill-plate of either side, which open into a great central channel,—the anal chamber leading to the exhalant siphonal tube. The gill-plate is suspended from the dorsal margin of the branchial chamber by a membrane, which, passing under the posterior or dorsal portion of the leaflet, is united to the outer lamina, the union being marked by the external longitudinal line.

The posterior or dorsal portion (*n*) of the leaflet is formed of only a single lamina, and must therefore be looked upon as a rudimentary gill-plate. It is attached by the whole length of its ventral margin, which is defined by the external line (*o*) already alluded to, to the outer lamina of the gill-plate, and by its dorsal border to the dorsal margin of the branchial chamber. Thus an additional channel is formed beneath each rudimentary gill, and external to the membrane which suspends the gill-plate; these two channels open likewise into the anal chamber. There are consequently four channels leading from the breathing apparatus towards the exhalant siphonal tube; two being from the origin of the perfect gill-plates, two from below the rudimentary gill-plates.

This arrangement of the branchial organ is precisely similar to that of *Cochlodesma*, only in the latter the gill is more elongated, consequently the channels in connexion with it are greatly increased in length, and the central channel or exhalant chamber becomes more obvious. From Professor Owen's description of these parts in *Pholadomya*, they would also appear to be arranged

in a very similar manner, there being perhaps some slight, but unimportant, modifications. In *Myochama*, however, the branchial and anal chambers are not perfectly divided as they are in *Cochlodesma*, and probably in *Pholadomya*. In the former the septum which cuts off the communication does so only partially, there being a considerable aperture in it (fig. 1 *f*) just where it joins the extremity of the gills. It is quite possible that this aperture may be the result of injury, for these parts are so exceedingly delicate that the examination of more than one specimen is necessary to determine this point with certainty.

It is pretty clear too that the gills of this animal resemble very closely those of *Chamostrea*; the most important difference being, that in the latter the dorsal border of the rudimentary gill is free, while we have seen that in *Myochama* it is attached. The minute structure of the organ is the same in both; it is therefore only necessary to refer to my paper on *Chamostrea* recently published in the 'Annals,' where a detailed description of this part of the subject will be found. It may be observed, however, that the surface of the branchial leaflet of the animal under description is transversely plicated; but the plicæ are not so numerous, neither are they so delicate nor so much produced as they are in that genus; and it may be further remarked, that in this respect *Myochama* agrees better with *Cochlodesma*, in which the plicæ are rather coarse and thick. Such slight differences are certainly of very little importance, and can in no way affect the function of the parts. The food will be secured on the surface of the gills in *Myochama* exactly as in *Chamostrea*, and the water will be strained through the organ in a similar manner; in the former as in the latter it will find its way, through the vascular network forming the plicæ, into the spaces or tubes between the gill-laminæ, and from thence into the dorsal channels leading into the anal or exhalant chamber, and so to the siphonal outlet. From the rudimentary gill the water will be strained into the channel situated below it, and thus reaching the anal chamber will pass out with the general current.

In concluding these few remarks on the branchial organ, it may perhaps be worthy of notice that there appear to be three distinct modifications of gill-structure in the *Lamellibranchiata*. In the first the laminæ forming the gill-plate are composed of filaments, either free or only slightly united to each other at distant intervals, as in *Anomia* and *Mytilus*; in the second they are formed of a simple vascular network, as in *Mya*, *Pholas*, &c.; and in the third the laminæ of the gill-plate are complicated by the addition of transverse plicæ composed of a minute reticulation of vessels, as in *Chamostrea*, *Myochama*, *Cochlodesma*, &c.

Other modifications may exist, but these are all that have come under my observation.

The body or visceral mass (*j*) of *Myochama* is largely developed, and projects downwards and forwards from between the branchial plates; it is somewhat compressed and inclined to a triangular form, with a small conical foot (*k*) rising abruptly in front from the inferior extremity. The liver is of a pale brown colour, and is composed of numerous small lobules, irregular in form and size, which appearing all over the surface of the visceral mass give to it a peculiar tessellated appearance. The intestine passes round the external surface of the posterior adductor muscle, and terminates within the anal chamber close to the base of the exhalant tube as a simple tubular anus.

From this description of the animal of *Myochama*, it would seem evident that the proper place in the arrangement of this genus is with the *Anatinidæ*, if we may take *Cochlodesma* as a type of that family. The former agrees in every essential character with this latter genus: the siphonal tubes are long and narrow, the mantle is closed, and there is a single gill-plate and a rudimentary gill-plate on each side arranged exactly in the same manner. *Chamostrea* differs from *Myochama* chiefly in having short, wide tubes, and in the rudimentary gill-plate having its dorsal margin free.

#### EXPLANATION OF PLATE XI.

- Fig. 1.* General view of the animal of *Myochama anomioides*, the left mantle-lobe laid open:—*a*, anterior slope; *b*, posterior ditto; *c*, ventral margin; *d*, pedal orifice; *e*, orifice leading to inhalant tube; *f*, orifice in the septum dividing anal and branchial chamber; *g*, exhalant tube; *h*, inhalant ditto; *i*, fourth aperture leading into branchial chamber with a needle passed through it; *j*, body or visceral mass; *k*, foot; *l*, palps, the superior overhanging the mouth; *m*, perfect gill-plate; *n*, rudimentary gill-plate; *o*, line dividing the two portions of the gill-leaflet; *p*, ovary; *q*, posterior adductor muscle; *r*, anterior ditto.
- Fig. 2.* Front view of visceral mass:—*a*, liver; *b*, foot; *c, c*, margins of gill-plates; *d*, mouth; *e, e*, superior pair of palps; *f, f*, inferior ditto.
- Fig. 3.* View of siphonal tubes:—*a*, inhalant tube; *b*, exhalant ditto; *c*, fourth or small aperture leading into branchial chamber; *d, d*, margins of mantle-lobes forming a recess for the accommodation of the tubes; *e*, posterior adductor muscle.
- Fig. 4.* External view of pedal orifice:—*a*, pedal orifice; *b, b*, margins of mantle-lobes; *c, c, c*, anterior adductor muscle.